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## Solar E-Vehicles

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### ABSTRACT

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The global demand for and availability of energy is increasing every day. Because conventional energy sources such as coal and petroleum are limited and diminishing, renewable energy supplies will become increasingly significant in the future. In the current circumstances, the energy crisis is a serious and pressing issue that must be addressed. It basically involves confirming the availability of extra generators or increasing the generation capacity. Alternatively, a load management method known as demand side management (DSM) is required. The usage of fossil fuels for domestic transportation is quickly expanding in the current environment, indicating a hazard in the near future. The negative consequences of using such vehicles and methods include pollution of the environment and health issues relating to living habitats. In line with this, E-vehicles, which are environmentally friendly, are the upcoming means of transportation. The usage of electric energy for propulsion is a disadvantage of this mode of transportation, since it will place additional strain on the current power system and infrastructure. However, the use of power electronics and controls in electric vehicles (EVs), as well as other cutting-edge technology, is promoting and supporting green transportation systems. The electric vehicle charger plays an important role in reducing our reliance on fossil fuels and is a natural evolution of our energy infrastructure. Incentives for consumers are also crucial in making the purchase of an electric vehicle and a home fast-charging station more reasonable and appealing. To overcome this problem, the majority of wealthy countries have begun to extract solar photovoltaic conversion systems for storage and transmission to the grid. In comparison to the previous decade, the current rate of utilization of E-vehicles is 70%. In terms of solar energy, it is mostly extracted as either heat or light energy. However, due to technical and economic constraints and challenges, the storage system is the bottleneck in this regard. If there is no solar energy available, the power electronics interface allows a male E-vehicle battery to be charged from the grid (G2V). The alternative method is to transfer stored energy from the storage battery to the grid (V2G) when the grid is unable to meet its load requirements. The solar PV panels on the vehicle's roof create electricity, which is then utilised by the battery support to power the vehicle. As a result, electric vehicles equipped with solar PV panels can potentially send electricity to the grid (V2G). As a result, with the right design and implementation, the solar photovoltaic source can prove to be a potential source for such E vehicle applications in the near future. This provides engineers and businesses with an opportunity.

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Keywords: *E-vehicles, solar energy*

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### INTRODUCTION

The major goals of the "Solar energy E-vehicles" idea in the environment. The possibilities for using alternative technologies in automobiles, such as electric/hybrid vehicles, must be figured out, or a plug-in hybrid electric vehicle must be developed by converting an existing conventional vehicle with a suitable motor and battery. It's also important to understand why electric vehicles aren't attracting enough customers. Marketing and manufacture of E- vehicles can be done, and difficulties can be handled, by using appropriate technical solution methodologies that take into account consumer needs and economic restrictions. Consumers should be aware of the CO<sub>2</sub> emissions produced by fossil fuel-powered vehicles, as well as government measures to promote E-vehicles through subsidies. The demand for electrical energy is growing at an exponential rate, which is critical for many aspects of modern living. The world's population is growing at an exponential rate. As a result, energy sources will play a critical role. Current methods in this area have the potential and priorities to reduce greenhouse gas emissions, increase energy efficiency in homes, offices, and enterprises, and promote energy marketing, management, conservation, and security. These also look for practical and economical alternative energy sources, as well as producing cleaner and more efficient transportation vehicles and systems, as well as energy policy and strategy. The present globe faces severe difficulties such as excessive fossil fuel extraction, depletion, and environmental deterioration. To address these issues, renewable energy has recently gotten a lot of attention because of its environmental benefits. Renewable energy will face stiff competition from fossil fuels in the near future. The first law of thermodynamics, generally known as the law of conservation of energy, asserts that energy cannot be generated or destroyed; instead, it can only be transformed from one form to another.

Solar energy comes from the sun, which is a massive source of energy in the form of heat and light due to nuclear fusion at its core. The nuclear

process releases energy, which travels to the sun's surface. Every year, the earth absorbs around 3,850,000 exajoules of solar energy, the majority of which is light energy. Few systems use thermal energy for heating, whereas the majority convert or transform light into electrical energy. In the current circumstances, the energy crisis is a serious and pressing issue that must be addressed. It basically involves confirming the availability of extra generators or increasing the generation capacity. Alternatively, demand-side management strategies like demand control and shift or curtailment (DSM) must be implemented. The usage of fossil fuels for domestic transportation is quickly expanding in the current environment, indicating a hazard in the near future. The negative consequences of using such vehicles and methods include pollution of the environment and health issues relating to living habitats. In line with this, E- vehicles, which are environmentally friendly, are the upcoming means of transportation. The usage of electric energy for propulsion is a disadvantage of this mode of transportation, since it will place additional strain on the current power system and infrastructure. With the introduction of power electronics, E- vehicles (EVs) become one of the most practical and environmentally friendly modes of transportation. Depending upon the below Literature Survey of different papers we have decided to moved forward to take this project in practical means. For this purpose we have aimed to construct a solar electric vehicle. To save renewable energy ex petrol or diesel.

## LITERATURE REVIEW

Electric vehicles are increasingly seen as a means of reducing carbon emissions for transport operations. The first mass produced fully electric vehicle was the Nissan Leaf. The number of Leafs sold passed 50,000 on the 14th February 2013 and the total mileage covered by Leafs has exceeded 161 million miles (260 million km).

- The sales of battery electric vehicles such as the Leaf are exceeding those of the Toyota Prius, the first mass produced hybrid vehicle, at an equivalent stage of its market life.
- Vehicle to Grid technology, allowing electric vehicles to act as a power source, is seen as a major selling point for electric vehicle technology. The use of vehicle batteries in this way means that during overnight charging the vehicles can be used as localized buffers to smooth the load on the power supply grid.
- A further advantage offered by battery electric vehicles is the removal of emissions from the point of operations, offering improved air quality in congested cities.
- Most of the vehicles are running on the gasoline fuels. These vehicles exhaust hazardous gases. This increases the environmental pollution in the world. In recent years to reduce the pollution researchers have given the solution of EV's or hybrid vehicles and many countries adopted this as one of the best solutions to reduce pollution. The popularity is due to battery and silent operation. The present challenge is the optimization of best battery and charging.

## E-VEHICLES AND WORKING

The block diagrams of proposed E-vehicle having solar charging and facility to interface with local grid for the charging and discharging is presented in the following section.

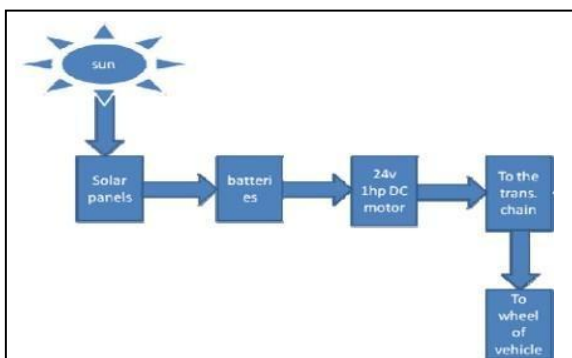


Figure 3: Block diagram solar E-vehicle.

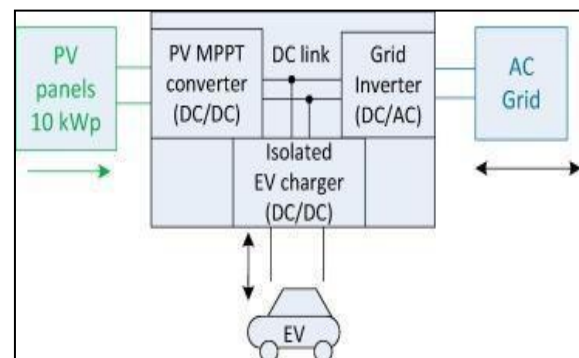


Figure 4: Functional block diagram.

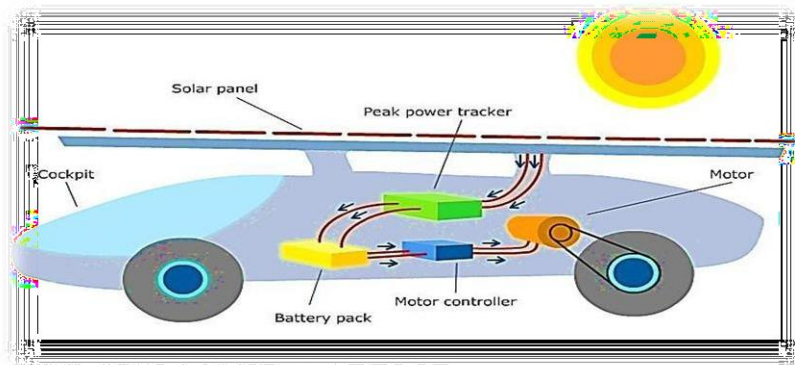
Fig. 3 show a general diagram of E- vehicle having solar charging option. Due to the unavailability of sun during night hours of a day it demands large storage battery as per the capacity of the vehicle. The modification on the said model is to provide charging option not only from solar it is also from electric grid as shown in Fig. 4. Sun is the secondary source of energy for the vehicle. Energy from sun is collected by the solar panels and is stored into the batteries. For a sample case study, a vehicle utilizes 24V DC series motor and a storage battery. The rear wheel of the vehicle is connected to motor through chain sprocket. Before the study of the model the battery is assumed to be charged fully and during the transit of the vehicle the charging is done. It is very important for the batteries to charge and discharge to keep their life cycle good. The solar powered vehicles utilize various components and a list of components is shown in the Table 1 for a solar powered four-wheeler.

**Table 1:** List of components used for four-wheeler.

Components used	Range	Quantity
Batteries( heavy inverter batteries)	24V 190Ah	2*12V
Solar module	140Wp(Watt Peak)	1
Connecting Cables	Motor connection:-25Sq.m m high voltage cables.  Solar module to charge controller unit:-1Sq.mm  Charge controller to battery unit:-2Sq.mm	10 meters  1 meter  1 meter
Motor	High torque DC motor 1Hp=746W	1

## WORKING PRINCIPLE

The electronic charge controller and the solar panel help to charge and control the energy in the battery for the vehicle's operation with suitable protection of depth of discharge and over charge etc. A 140 Wp solar module is used with output ranging from 24V to 25V DC at standard test conditions (STC) is present in the sample case example. The batteries are initially fully charged before the usage of vehicle. The solar panel installed charge after converting light into electricity. The features incorporated keep the condition of the set up good as the availability of solar insolation matters the most as per the geographical position of the vehicle. Generally, in India, between 9:30 am to 3:30pm with proper mounting of solar panels best electricity extraction can be achieved. The motor mounted in the vehicle can perform its intended movements as per the control with the battery power. Fig. 5 shows a sample E-vehicle.



## ADVANTAGES

- No Fuel Costs:
- Renewable Energy Source
- Reduces Electricity Bills
- Low Maintenance Costs
- Technology Development

## Applications

Also in this sense, solar energy could be used for car propulsion in different ways in indirect way, to produce bio-fuels (for conventional vehicles) or hydrogen (for fuel-cell vehicles, or vehicles with ICE fuelled with hydrogen or a mix of methane and hydrogen)

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## RESULTS

Solar cars have been developing since the last twenty years and are powered by energy from the sun. Although they are not a practical or economic form of transportation at present, in the future they may play a part in reducing our reliance on burning fossil fuels such as petrol and diesel.

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## CONCLUSION

The present mix mode of transportation is having adverse emissions to the atmosphere and the current practice to reduce the impacts of these emissions is of greater importance. The practice of electricvehicles (EV) in this regard added greater value and provided large scope to the development and research. The associated government policies and benefits to both the manufactures and user need to be revisited to enhance the E-vehicle market. But the popularity of silent and ecofriendly electric vehicles is increasing nowa day's creating bundle of opportunitiesfor the enterprises and users.

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